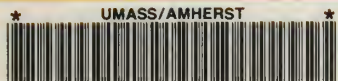


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INFANT FEEDING POLICY

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

INFANT FEEDING POLICY
Revised edition

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INTRODUCTION

The Massachusetts Maternal and Child Health Policy on Infant Feeding is designed to present recommendations about infant feeding which are advocated by the Office of Maternal and Child Health of the Massachusetts Department of Public Health. This policy also provides the rationale behind each recommendation. The topics discussed are: milk feedings, beikost and specific nutrition-related problems.

This material is intended for use by public health nutritionists and health care providers with whom they work, in the hope of providing a consistent approach to the area of infant nutrition. Although these guidelines are appropriate for healthy, full term infants, they are particularly directed toward infants at social or economic risk. Some of the recommendations, therefore, are designed as protection against nutrition-related problems most common in public health settings.

These guidelines are based on the premise that certain practices will provide the infant with optimum nutrition for the present and for the future. The recommendations are derived from the most current scientific information available and apply only to healthy full-term infants who have no current medical problems.

Following is a summary of the Massachusetts Maternal and Child Health Policy on Infant Feeding:

- *Breastfeeding is the best type of feeding during the first year.
- *If breastfeeding is not possible, not chosen, or discontinued, infant formula is the best alternative.
- *Formula should be iron-fortified and should be used for at least the first 6 months and preferably for the first year of life.
- *If unmodified cow's milk is used after 6 months, it should be whole milk. Use of skim or lowfat milk is inadvisable in the first year.
- *The use of vitamin and mineral supplements should be based on the type of milk feeding used.
- *Beikost should be introduced at 4 to 6 months of age; its use before this time is unnecessary and inadvisable.
- *The solid foods offered should have a high nutrient density and should complement the type of milk being offered.

With regard to the format of this document, each policy is underlined and is followed by rationale and discussion. This outline is a policy statement only; the resources listed in Appendix 1 provide guidance for the practical application of the recommendations made here.

MILK FEEDINGS

BREAST MILK

A. Breast milk is the ideal food for infants.

1. Antibacterial and antiviral factors present in human milk result in less gastrointestinal and respiratory infections. (13)

- Bacteria affected: *E. coli*, *Vibrio cholerae*, *Salmonella*, *Shigella*, *Staphylococcus aureus*, *Clostridia tetani*, *Haemophilus pertussis*, *Diplococcus pneumoniae*, *Corynebacterium diphtheriae* and several strains of *Streptococcus*.
- Viruses affected: poliomyelitis, coxsackievirus, echovirus, influenza virus, reovirus, and rhinovirus.

NOTE: Colostrum has the highest content of most resistance factors; however mature milk also contains levels significantly higher than those found in cow's milk.

a. Cellular factors

(1) Macrophages

- Cells which are phagocytic and produce lactoferrin.

(2) Lymphocytes

- Cells which synthesize IgA antibodies.

b. Humoral factors

(1) Immunoglobulins

- Proteins which protect the digestive tract against organisms which infect the mucosa or which enter the body through the gut, especially *E. coli*, poliomyelitis, coxsackievirus, *Salmonella* and *Shigella*.

NOTE: IgA is the most prevalent immunoglobulin (90% of immunoglobulins in breast milk are IgA). There is 10 times more IgA in human milk than in whole cow's milk. Others which are present are: IgG, IgM, IgD and IgE.

(2) Bifidus factor

- A nitrogen-containing carbohydrate which supports the growth of *Lactobacillus bifidus*, a microorganism which converts lactose to acetic and lactic acids. A low pH results which inhibits the growth of *E. Coli* and protects against infections from *Staphylococcus aureus*, *Shigella* and protozoa.

(3) Resistance Factor

- A part of the free acid of the phosphide fraction, which protects against staphylococcal infections.

(4) Lysozyme

- An enzyme which increases with the duration of lactation and protects against Enterobacteriaceae and gram-positive bacteria.

(5) Lactoferrin

- An iron-binding protein which has a strong bacteriostatic effect on Staphylococcus aureus and E. Coli, by depriving them of the iron they need to grow.

(6) Interferon

- A protein with strong antiviral properties which is produced by macrophages in the colostrum.

2. Nutritional composition of human milk is more suited to the infant's digestive and metabolic systems than is the composition of whole cow's milk (WCM) or formula. (See Appendix 2)

- a. The whey:casein ratio of breast milk is 60:40; WCM and most formulas have a ratio of 20:80. Casein forms large, insoluble curds in the stomach. Human milk is more easily digested because, with its low casein content, it forms a suspension with small curds and a low curd tension.
- b. Breast milk has a lower protein content than WCM and a lower electrolyte content than either WCM or formula. Breast milk therefore has a lower renal solute load.
- c. Breast milk has more saturated fat and cholesterol than formula. These components may enhance the development of a cholesterol regulatory mechanism. (25, 31)
- d. The iron content of breast milk is much lower than that of iron-fortified formula but the percent of iron absorbed is much higher. The average amounts of iron absorbed are as follows: 49% from breast milk, 10% from WCM and 4% from iron-fortified formula. (27, 28)

The low level of iron in breast milk may favor its bacteriostatic action. (See (5) Lactoferrin, above)

3. Fewer allergic reactions occur in breastfed infants.

- a. IgA prevents the absorption of foreign macromolecules.
- b. The protein in human milk is species-specific and therefore less allergenic for the human infant.

4. Psychological benefits for the infant can result from breastfeeding; bonding is encouraged.

B. Breastfeeding imparts benefits to the mother.

1. Breast milk requires no preparation and is convenient.
2. Postpartum weight loss may be more rapid (2-4 kilograms in 3 months, on the average).
3. Uterine contraction is more rapid because suckling releases oxytocin which causes involution of the uterus.
4. Ovulation may be delayed due to the release of prolactin during breastfeeding. Breastfeeding, however, is not a reliable method of birth control. Women who do not wish to conceive should use some form of contraception.

C. Additional calories and nutrients are needed by the breastfeeding mother.

1. During the first 3 months:

a. Additional 500 kilocalories/day

(NOTE: This amount should be in addition to the woman's normal, non-pregnant diet and assumes her infant is totally breastfed.)

- This figure is based on the assumption that the average milk production is 850 ml/day, that 750 kcal/day would be needed to produce this amount and that the woman's fat stores could provide 200-300 kcal/day. (18)
- More than 500 additional kcal/day would be needed if: weight gain during pregnancy was subnormal; weight during lactation falls below ideal; more than one infant or child is nursed. (The specific number of additional kilocalories needed will vary with each individual.)
- Less than 500 additional kcal/day would be recommended (provided the intake of other nutrients is adequate) if: weight gain during pregnancy was excessive or the infant is not totally breastfed.
- Moderate to severe restriction of calories can compromise the quantity and quality of breast milk especially in the early weeks of lactation. (42) Rapid weight loss could lead to ketosis which would alter the pH of the breast milk. (36)

b. Additional 20 gm protein/day

c. Additional calcium and trace minerals and vitamins C, E, folacin and B vitamins, in amounts specified in the 1980 RDA's (See Appendix 3)

2. After 3 months (if infant is still totally breastfed):

- a. More than an additional 500 kilocalories/day, based on maternal weight, frequency of feeding, etc.
- b. The nutrients, specified for lactating women in the 1980 RDA's.

D. Supplements are needed by breastfed infants.

1. Vitamin D: 400 IU/day

Some authorities feel that an infant who has a healthy mother and who has some exposure to the sun does not need a vitamin D supplement. Several investigators found substantial amounts of vitamin D sulfate in the whey or water soluble portion of breast milk. (24,39) However, more recent studies, using a more precise method of assaying vitamin D sulfate, have shown the amount to actually be quite small, and the vitamin D sulfate which is present has very low biological activity. (22,35) Because of these studies, and because there is some documentation of rickets among non-supplemented infants with limited exposure to the sun, most authorities still recommend a supplement. (5)

2. Fluoride: 0.25 mg/day

- a. Negligible amounts of fluoride pass through breast milk, even if mother consumes fluoridated water.
- b. A supplement would not be needed by an infant consuming an appropriate amount of fluoridated water. (See Appendix 4)

3. Iron

- a. Before 6 months: no need for additional iron
(Premature infants: supplement needed when infant is 2 months old or weighs 5.5 pounds)

Iron stores and iron supplied by breast milk are sufficient until this time. No concrete evidence exists that lack of an iron supplement before 6 months results in iron deficiency anemia in a breastfed infant. (2,32) Furthermore, additional iron may lessen the bacteriostatic effect of the lactoferrin in breast milk. (21)

NOTE: Some authorities feel, however, that the possibility of iron deficiency anemia outweighs the risk of impaired bacteriostatic function and recommend starting an iron supplement at birth. (16) In a public health setting where infant anemia rates are high, this recommendation may be appropriate.

- b. After 6 months: 15 mg/day

- The rate of absorption of iron decreases once solid foods are introduced. (33)
- The iron content of breast milk decreases from 0.5 mg/liter during the first month to 0.3 mg/liter by four to six months. (38)

c. Best form in which to provide iron is in dry iron-fortified infant cereal

- The iron in these cereals is well-absorbed and is provided in food rather than as a vitamin/mineral supplement.

NOTE: If a vitamin/mineral supplement is used, the amount of vitamins A and C in the infant preparations containing fluoride, vitamin D and iron is not harmful when taken as prescribed. (See Appendix 5)

E. Management of breastfeeding

(For references which discuss details of breastfeeding management, see Appendix 1)

1. Women intending to breastfeed should be offered support. Breastfeeding needs to be encouraged; it is a learned activity. Appropriate support can be provided by health care professionals, volunteer agencies, and ideally, by family and friends.
2. Any amount of breastfeeding should be encouraged.

- a. Short term: Colostrum alone provides substantial nutritional and immunological benefits.
- b. Long term: The advantages of breastfeeding continue for at least one year.
 - Immunological benefits decrease but the nutritional advantages continue. (8)
 - Incidence of illness from infection is still lower at one year among breastfed infants (even those partially breastfed) compared to those fed formula or WCM. (9)
- c. Partial: Many of the benefits of breastfeeding will still be conferred on both the infant and the mother. Supplemental feeding should be iron-fortified formula, if not breast milk.

NOTE: The use of a breast-pump or manual expression of breast milk may be appropriate depending on the mother's milk supply and motivation. As with formula preparation, proper sanitation methods should be followed. (See Appendix 6)

3. Frequency of feeding: See Appendix 7.

4. Contraindications to breastfeeding:

- a. Lack of desire on the part of the mother
- b. Certain medical conditions

Lack of agreement exists as to which conditions are absolute contraindications; decision should be based on physician's judgement. (See references 25 p.104, 47 p. 220)

c. Certain drugs

Decision should be based on physician's judgement. (See references 40, 41, 47 p. 221)

d. Caffeine, alcohol and cigarettes - Moderate use of these substances does not contraindicate breastfeeding, but should be discouraged.

- Six to eight cups of coffee per day can cause symptoms of irritability in the infant. (25) More than 20 cups can be harmful. (36)
- Alcohol may inhibit the let-down reflex. Excessive use is inadvisable as alcohol passes into the breast milk. (41)
- Smoking inhibits the let-down reflex and appears to decrease the milk supply. Some authorities contend that smoking more than 20 cigarettes per day contraindicates breastfeeding. (42) More than 10 cigarettes per day is inadvisable. (41)

e. Certain environmental contaminants, such as PCB's, PBB's and DDT - Their presence in breast milk does not contraindicate breastfeeding unless there has been heavy exposure. Certain precautions should be taken in areas reporting high levels. (44, 47 p. 222)

- If testing for the levels of these contaminants in the milk is available (often through a state health department), it is encouraged.
- If high levels are detected, the length of time for breastfeeding should be shortened.
- Rapid postpartum weight loss should be discouraged as these environmental contaminants are stored in the mother's fat reserves.
- Fresh-water fish caught in contaminated waters should not be eaten.

INFANT FORMULAS

- A. Iron-fortified formula is the best alternative to breast milk for infants up to one year of age.
1. The nutrient content of formula approximates breast milk.
 - a. Proportions of total energy as fat, protein and carbohydrate are similar to those in human milk. (See Appendix 2)
 - b. Many vitamins and minerals are added to formula. Some of these nutrients are added in amounts higher than naturally found in breast milk in order to compensate for lower absorption.
 - c. Formula provides a constant and reliable source of nutrients, some of which are not present in sufficient amounts in cow's milk. These nutrients could be important during the period from 6 to 12 months when regular eating patterns are not yet established.
 2. Iron deficiency anemia is less likely to occur in infants fed iron-fortified formula than in infants fed whole cow's milk.
 - a. Prevention of iron deficiency anemia is important in a public health setting, such as the WIC Program, because the incidence of anemia is highest among the lower socio-economic population. (3, 15 p. 305)
 - b. Iron-fortified formula is a good vehicle for providing iron.
 - The iron is of a type (ferrous sulfate) that is readily absorbed. Also, the added ascorbic acid enhances iron absorption.
 - Iron-fortified formula provides a constant and reliable source of iron.
 - c. Formula causes less gastrointestinal irritation than does whole cow's milk. Possibly as much as 33% of the cases of severe anemia among infants, aside from those with a milk allergy, result from chronic intestinal blood loss induced by exposure to the heat labile protein in whole cow's milk.(29 p. 1376)
 3. Iron-fortified formula causes less physiological stress to infants than does whole cow's milk.
 - a. Heat treatment of the protein in formula results in a more digestible curd than the protein in cow's milk.
 - b. Reduced amounts of protein, calcium and sodium in formula result in a lower renal solute load than cow's milk. Because of its higher renal solute load, the amount of water in cow's milk may not be enough to satisfy the infant's renal and extra-renal needs when the environmental temperature is high or when fever, vomiting or diarrhea are present. (2)

- c. The protein in formula causes less gastrointestinal stress. (See 2.c. above)

NOTE: The incidence of gastrointestinal irritation due to the iron in formula is actually very low. Two studies found no difference in the incidence of diarrhea, constipation or other GI distress, between infants fed iron-fortified formula and those fed a placebo. (20, 32) Another study found that only 5% of the cases of gastrointestinal disturbance among a group of infants could be attributed to iron-fortified formula.(15) (See SPECIAL CONCERNS section for recommended treatment of constipation.)

B. Iron-fortified formula should be started at birth.

1. Iron stores are used up by 4 to 6 months in term infants. The early use of iron-fortified formula may result in augmentation of iron stores, which would help to prevent the later development of iron deficiency.(3)
2. Feeding the infant iron-fortified formula from birth will assure that s/he will be receiving a regular source of iron by 4 - 6 months. This is especially important if the family does not receive regular health care. It is important to prevent iron deficiency anemia from developing initially because some abnormalities caused by anemia - to the brain, for example - may persist after resolution of the anemia. (10)
3. Exception: Premature Infants. Iron given from birth may cause hemolytic anemia, especially if the infant's diet is low in vitamin E and high in polyunsaturated fatty acids (PUFA's). (45) Some pediatricians advise waiting until the infant is 2 months old or weighs approximately 5.5 pounds before starting iron supplementation. If iron supplementation is started at birth, the infant's formula should contain adequate vitamin E and moderate amounts of PUFA's. (15 p. 220)

C. Content of the formula for normal, healthy infants should be:

1. Calories: 20 kcal/ounce
2. Iron: at least 12 mg/liter
3. Complete nutrition when used at normal dilution.

D. No one brand is recommended over another. (See Appendix 8 for available infant formulas.)

1. The composition of some formulas, however, approximates the content of breast milk more closely than other formulas. (See Appendix 2)
 - a. Protein: The whey:casein ratio is 60:40 in SMA, Similac Whey, PM 60/40 and breast milk; the ratio is 20:80 in Enfamil and Similac.
 - b. Fat: SMA contains less polyunsaturates, more monounsaturates, and slightly more cholesterol than does Enfamil or Similac; the fat pattern is closer to that of breast milk.
2. No independent studies have shown that the above qualities result in any significant differences in the health or development of infants.

- E. Special formulas are recommended for certain conditions, such as allergies, carbohydrate, fat or protein intolerance, and metabolic disorders. (See Appendix 8)
- F. Several varieties of formula are available:
1. Concentrate - Available in 13oz cans. Must be mixed with an equal amount of water.
 2. Powder - Available in 14oz or 16oz cans. One can makes approximately 3 quarts of formula. Although powdered formula is more difficult to mix than concentrated formula, it is economical and convenient, particularly for a breastfeeding mother who is supplementing only a few ounces of formula per day.
 3. Ready-to-feed - Available in 32oz cans. This is the most expensive variety. However, if the water supply is unsanitary or if the caretaker is unable to prepare the formula, this may be the best alternative.
- G. Proper care in the preparation of formulas is essential.
1. Improper preparation can cause serious problems. Formula which is too concentrated can cause diarrhea, vomiting, dehydration and kidney stress. Formula which is too dilute will not supply adequate calories. Instruction in distinguishing varieties of formula and in following directions carefully is essential.
 2. See Appendix 6 for proper preparation and sanitation techniques.
- H. Supplements needed by formula-fed infant: none except 0.25 mg fluoride in non-fluoridated areas. (See Appendix 4)
- I. Frequency of feedings and amount of formula needed: See Appendix 7

WHOLE COW'S MILK

- A. Whole cow's milk is not recommended until infant is at least 6 months old and preferably 12 months old. (See Appendix 9 - WIC Regulations)
1. The nutrient content and digestibility of formula make it a preferable alternative to whole cow's milk. (See A. under INFANT FORMULA for specific advantages of formula.)
 2. Many authorities see no need to use formula after 6 months of age provided the missing nutrients (iron and vitamin C) are supplied. (15)
These nutrients can be supplied by nutrient dense baby foods or by a supplement. (See C. and D. following)
- B. Evaporated or whole cow's milk should be used if an infant is not receiving formula or breast milk.
1. Evaporated milk may have some advantages over whole milk.
 - a. Curd tension is lowered by heat during processing, making the milk more easily digested.
 - b. Lactalbumin in evaporated milk appears to be less allergenic than the lactalbumin in whole milk.(29 p. 199)
 - c. Storage is easier.
 2. However, there is some evidence of traces of lead in evaporated milk from the seams in the can, the consequences of which are not known. (15 p. 375)
- C. Infants receiving whole milk after 6 months should be consuming at least 200 gm/day of high carbohydrate solids.
- 3/4 cup or 1½ jars of strained foods such as fruits, vegetables or cereals should provide sufficient carbohydrate to balance the high protein and fat content of cow's milk.
- D. Infants receiving whole cow's milk or evaporated milk need additional nutrients, preferably obtained from food.
1. Iron: 15 mg/day
Could be obtained from ½ oz dry, iron-fortified infant cereal.
 2. Vitamin C: 35 mg/day
Could be obtained from 3.5 oz of infant juice or 2 oz orange juice.
 3. Fluoride: 0.25 mg/day
Could be obtained from 4-6 oz fluoridated water. (See Appendix 4)
- E. Frequency of feedings and amount of milk needed: See Appendix 7.

LOWFAT OR SKIM MILK

Not recommended until infant is at least 12 months old, and preferably 18-24 months old.

1. Nutrient composition of skim and lowfat milk is inappropriate for infants. (See Appendix 2)
 - a. The essential fatty acid content is too low. 2-3% of total caloric intake should come from essential fatty acids; lowfat and skim milk contain less than this amount. (5)
 - b. The total fat and cholesterol content is too low.
 - c. The protein, calcium, sodium and phosphorous content is high in relation to the caloric content; the amount of lowfat or skim milk needed to satisfy the infant's caloric demands could therefore result in a high renal solute load.
2. Infants receiving lowfat or skim milk may be adversely affected. (15 p. 80,17)
 - a. Brain and nerve development may be impaired due to the low amounts of fat, cholesterol and vitamin E which are needed for myelinization.
 - b. Infant may have insufficient body fat stores due to consumption of inadequate calories. This lack could be dangerous during an illness which either decreases food intake or increases the demand for certain calories and/or nutrients.
 - c. Unsound eating habits could develop because the low caloric content of lowfat or skim milk could lead the infant to consume large quantities of milk or solid food.

/BEIKOST/*

A. Solids foods should be introduced when infant is 4-6 months old.

1. The infant's physiological development indicates that food other than milk is unnecessary and inadvisable before 4 months.
 - a. Nutritional: "On the basis of present knowledge, no nutritional advantage results from the introduction of solid foods before 4-6 months." (4)
 - b. Renal: The kidneys are unable to handle large osmolar loads of protein and electrolytes before 4 months. (4)
 - c. Gastrointestinal:
 - (1) Enzymes present in the early months of life can digest the fat, protein and carbohydrate in breast milk and formula, but not other fats, proteins and carbohydrates. The production of the salivary enzyme, ptyalin, and of pancreatic amylase increases at about 4 months, improving the digestion of starch. (14)
 - (2) The digestive tract of an infant does not mature until 4-6 months. Until this time it is permeable to macromolecules and contains a low amount of IgA antibody, making allergic reactions or sensitivities to solid foods more likely. (4,25)
 - d. Neuromuscular:
 - (1) The extrusion reflex begins to disappear and the ability to draw in the lower lip when food is placed in the mouth begins to develop by around 4 months. These developments increase the ability to swallow non-liquid foods.
 - (2) Chewing motions develop around 5-6 months.
 - (3) Head and neck control, and thus the ability to indicate interest and satiety, develops around 5 months.
 - (4) Hand-to-mouth coordination develops around 5-6 months.
 - (5) The ability to sit with assistance develops around 5-6 months.
 - e. Exception to the above recommendation: an infant weighing more than 16 pounds would need more than 40 ounces of formula per day to meet his caloric needs. A small amount of beikost would be preferable to such an excessive amount of formula.

*Beikost: Foods other than milk or formula

2. The early introduction of solids may have adverse consequences.

- a. The consumption of breast milk or formula, which are nutritionally superior to beikost, may decrease.
- b. A habit of overfeeding may develop.
- c. Food allergies may result.

3. Waiting longer than 6 months to introduce solid foods is inadvisable.

- a. Formula may lack certain micronutrients that could be supplied by beikost. (4)
- b. The caloric needs of an infant in the second half of the first year (105 kcal/kg) cannot be easily met by milk alone.
- c. The infant may reject solid foods if he has received only fluids for longer than 6 months.
 1. Obtaining food from the breast or bottle is easier than eating from a spoon.
 2. The taste and texture of beikost differs from milk.

B. Types, amounts and frequency of foods: See Appendix 7

C. Order of foods to be introduced depends on type of milk consumed.

1. Breast milk: Foods high in protein should be offered earlier than to an infant fed formula or cow's milk (eg: infant cereal with milk, yogurt, egg yolks) to complement the high carbohydrate and fat content of breast milk. These foods should not be given earlier than recommended on the Infant Feeding Guide. (See Appendix 7)
2. Formula: Foods with an even distribution of protein, fats and carbohydrates (ie: the variety of foods recommended on the Infant Feeding Guide) should be offered.
3. Cow's milk: Foods high in carbohydrate should be offered first (eg: fruits, vegetables, cereals; not meat or dinners) to complement the high protein content of cow's milk.

D. The home preparation of foods is encouraged.

1. Benefits of home preparation: economy; product control; integration of child into family eating pattern.
2. Certain foods and practices should be avoided.
 - a. Canned foods - they often have added salt and sugar and the can seam may contain lead.
 - b. Added salt, sugar, fats and honey.
 1. There may be an early imprinting of tastes; therefore, early exposure to salt and sugar may lead to subsequent excessive intakes. (4, 16)

2. Fats add calories with minimal nutritional value.

3. Honey may cause botulism. (A bacteria, *C. botulinum*, sometimes present in honey, may be converted to botulinal toxin in infant's intestine.) Infants under 1 year of age should not be given honey. (7)

3. Proper preparation techniques should be used. (See Appendix 6)

E. Many commercial infant foods are acceptable.

1. Plain foods are recommended over combinations.

a. Plain meats provide a more economical and concentrated source of protein than dinners, which usually contain broth, vegetables and starch fillers as main ingredients.

b. If the infant has an allergic reaction, it will be easier to determine the allergen if s/he has consumed only single ingredients.

c. It is important for infants to learn distinct new tastes.

2. Desserts are not recommended.

a. No essential nutrients are provided in significant quantities.

b. A preference for a sweet taste may be developed.

3. Junior foods are not necessary.

Mashed table foods provide a more economical alternative.

F. Water

1. Water is generally not needed by infants who are receiving only breast milk or formula. (4)

2. Exceptions:

a. Infants consuming a formula high in caloric density (≥ 24 kcal/oz)(4);

b. All infants during hot weather;

c. Infants who have an illness with a fever;

d. Infants being fed large amounts of formula (eg: 38-40 oz/day) in the first few months. Plain water would be a preferable alternative to excessive amounts of formula or to the early introduction of solid foods.

3. Water is needed by all infants once foods causing a high renal solute load are introduced (eg: meats, dinners, egg yolks). (4)

4. Sweetened water should not be used. It contains "empty" calories and it may contribute to a preference for a sweet taste and to the early development of dental caries.

/SPECIAL CONCERNS IN INFANT FEEDING/

ALLERGIES

A. It is desirable to withhold most common allergenic foods until 6-9 months.
(4, 37)

1. The digestive tract is immature until this time.
 - a. The gastrointestinal tract is permeable to macromolecules in early infancy.
 - b. IgA antibody develops slowly in infancy. Once it has lined the gut, it probably decreases the amount of antigenic material which passes through the mucosa. (4)
2. The most common allergenic foods are: cow's milk, egg whites, wheat and citrus fruits. Others are: corn, nuts, cocoa, fish, pork, berries and soy.
3. Recent studies have suggested that soy-based formula may be as allergenic as milk-based formula. When a milk allergy is suspected, a hydrolyzed protein formula rather than a soy formula, may be a better alternative. (12,19)

B. If foods are eliminated due to an allergy, other foods should be provided which contain the nutrients in the eliminated foods.

OBESITY

A. Definition of obesity: Because of human variability, a medically-based definition of obesity in children is difficult to develop. It can be defined in non-specific terms as an excessive ratio of fat to fat-free body mass. Several operational definitions are commonly used:

- An infant who is at or above the 90th percentile of weight for height.
(Standard used by Massachusetts WIC Program)
- An infant who is at or above the 95th percentile of weight for height.
(Standard used by American Academy of Pediatrics)

B. Obesity in infancy is undesirable.

Obese infants have an increased risk of becoming obese in childhood and adulthood. Genetics and environment both play a role in this development; the exact mechanism and the relationship between these factors is complicated and not clearly understood. Apart from the physiological mechanisms involved in the development of obesity, the practice of overfeeding may lead to a habit of overeating that may extend into childhood and beyond.

- C. The objective when treating an obese infant is to slow weight gain, not to achieve weight loss, and to encourage the development of sound eating practices.

Practices to achieve this objective:

1. Offer foods which are nutrient-dense and moderate in calories at meal-time.

Examples:	<u>FOOD</u>	<u>AMOUNT</u>	<u>KCAL</u>
	Plain Vegetables	4.5 oz/jar	25-75
	Plain meats	3.5 oz/jar	90-120
	Potatoes or rice	1/2 cup cooked	80
	Egg yolks	3.3 oz/jar	60

2. Offer high bulk, low calorie foods such as fruits and vegetables if between meal snacking is desired.
3. Offer plain water between feedings.
4. Avoid foods containing simple sugars and those with a high fat content.
5. Avoid adding butter, oil, lard, etc. to infant's food.
6. Avoid lowfat or skim milk. (SEE LOWFAT AND SKIM MILK section) Use no more than the recommended amounts of formula or whole cow's milk.
7. Offer food only when infant is definitely hungry; otherwise offer alternative types of comfort and stimulation.
8. Provide opportunities for activity.

BOWEL MOVEMENTS

- A. Infants' bowel movements vary significantly in frequency and consistency. An infant may pass 8 to 10 stools per day or 1 stool every four or five days. The softness or hardness can also vary significantly within a normal range depending on the infant and on his or her diet.
- Sudden changes from established stool patterns should be noted and treated if they are persistent.
- B. DIARRHEA: Diarrhea is commonly defined as the passage of frequent, unformed, watery stools. Diarrhea can be common during infancy and often passes before a cause can be determined. If it persists beyond a day or two, a pediatrician should be consulted. Acute, untreated diarrhea can lead to dehydration, acidosis, weight loss, starvation diarrhea and secondary illness. Chronic, untreated diarrhea can lead to slowed growth, significant nutrient losses and secondary illness. Treatment depends on the etiology. (6 p. 133, 11 p. 281)

1. ACUTE DIARRHEA: Acute diarrhea is caused by a variety of conditions, such as: bacteria, viruses, use of antibiotics, intake of allergenic foods or large doses of sugar. If it is properly treated, it will not be a threat to the health of the infant. The major dietary concern when treating diarrhea of short duration (2-3 days) is that adequate fluid and electrolytes are replaced and that nutrient-dense beverages and solids are introduced slowly, but as soon as possible.

Procedure to follow during acute diarrhea: (6 p. 188, 11 p. 281)

- a. Consult a physician for diagnosis and recommendations for treatment (see NOTE below).
- b. Remove all solid foods and beverages from the diet.
- c. Replace fluid and electrolytes, approximate 2 oz per hour, using either:
 - Pedialyte - This liquid is balanced in fluid and electrolytes but is expensive, or
 - Dilute and flat cola drinks, dilute apple juice, or Kool-Aid - These beverages replace fluid and provide some calories but do not provide balanced fluid and electrolytes or significant amounts of nutrients.
- d. Reintroduce nutrient-dense beverages and solid foods, using: *
 - Dilute formula, lowfat or skim milk - Within 24-48 hours, start with 1/4 strength (1 oz formula or milk to 4 oz water) and increase to 1/2 strength, up to full strength as tolerated.
 - Rice cereal - By 36-48 hours, start rice cereal diluted 1:6 with formula, lowfat, or skim milk.
 - Introduce other solids appropriate for the infant's age as tolerated.
 - Whole cow's milk, if used, should be reintroduced only after a normal stool pattern has been established.

NOTE: In the first 24 hours, it may not be practical to consult a physician, and the diarrhea may resolve itself during this time. However, if the diarrhea persists beyond 24-36 hours, steps a., b. and c. should be followed.

*The following schedule is a general guideline only; depending on the severity of the diarrhea, the timing may vary.

2. CHRONIC DIARRHEA: Chronic diarrhea may be non-specific, infantile diarrhea (irritable colon syndrome) without major malabsorption problems. Dietary treatment of this type of diarrhea is often ineffective, and spontaneous resolution usually occurs by 3 to 5 years of age. (6 p. 183)

Chronic diarrhea, however, can have a specific cause, including: milk intolerance, celiac disease, sucrase deficiency, or acquired disaccharidase deficiency following an acute episode of diarrhea. Treatment varies according to diagnosis.

A physician should always be consulted if the caretaker reports frequent episodes of diarrhea. Doing a careful dietary intake and reviewing the infant's medical history will help to determine if the diarrhea is diet-induced.

- C. CONSTIPATION: Constipation can be defined as a hard, dry stool which is painful to expel. Before any treatment is recommended, the practitioner should determine whether the caretaker has a correct perception of the problem. The infant's bowel patterns may be within a normal range.

True constipation, however, is not uncommon during infancy. If the condition is chronic and/or accompanied by blood or mucus, a physician should be contacted. If the constipation is transitory and appears to be caused by diet or stress related to the feeding routine, nutrition intervention alone may be effective. (11 p. 278)

Recommendations for nutrition intervention:

1. Consider the social and psychological factors surrounding the feeding routine. If the environment seems stressful, help the caretaker to understand some of the factors that may be causing the constipation.
2. Increase fluids, especially water or dilute apple or prune juice.*
3. Increase foods which contain fiber, assuring that the diet remains in balance. For example, offer fruits and cooked vegetables and whole grain cereals and breads as snacks and at mealtime. This is recommended only for infants 8 months of age or older.
4. Changing formula brands, allowing 2 or 3 days between each trial, or alternating iron fortified with non-iron fortified formula for a few days are possible suggestions. No controlled studies have demonstrated the efficacy of these practices. (See INFANT FORMULAS-A.3. NOTE) However, many caretakers attribute their infants' constipation to the brand or type of formula used; changing the formula would be preferable to discontinuing its use. It should be noted that iron fortified formula should not be eliminated altogether, especially after 4 months. (See INFANT FORMULAS-B.)

*Karo syrup in water is often the treatment of choice among doctors and nurses. Dilute apple and prune juice are better substitutes because they provide some nutritional benefits, and recommending them over sugared water may reduce the use of highly sugared water as a regular infant drink.

APPENDICES

Appendix 1

RESOURCES FOR PROFESSIONALS

/Infant Feeding/

Feeding Guide: A Nutritional Guide for the Maturing Infant, Mead Johnson and Company. Evansville, Indiana, Mead Johnson Nutritional Division, 1979, 40pp.

Feeding Recommendations for Healthy Infants, Missouri Division of Health, Department of Social Services. Jefferson City, Missouri, 1982, 26pp.

Food, Nutrition and the Young Child, Jeanette Endres and Robert Rockwell. St. Louis, C.V. Mosby Co., 1980, 312pp.

Infant Feeding Guidelines, Georgia Department of Human Resources, Division of Public Health. Atlanta, Georgia, 1982, 12pp.

Infant Nutrition, Samuel Fomon. Philadelphia, W.B. Saunders Co., 1974, 575pp.

Nutrition in Infancy and Childhood, Peggy Pipes. St. Louis, C.V. Mosby, Co., 1981, 317pp.

/Breastfeeding/

Breast-Feeding: A Guide for the Medical Profession, Ruth Lawrence. St. Louis, C.V. Mosby, Co., 1980, 367pp.

Breastfeeding Handbook: A Practical Reference for Physicians, Nurses, and Other Health Professionals. Hillside, N.J., Enslow Publishers, 1980, 256pp.

Breastfeeding Your Baby, Marsha Walker and Joanne Driscoll. Wayne, N.J., Avery Publishers, 1981, 60pp.

Nutrition in Pregnancy and Lactation, Bonnie Worthington-Roberts. St. Louis, C.V. Mosby Co., 1981, 309pp.

Preparation for Breast Feeding, Donna and Rodger Ewy. Garden City, New York, Dolphin Books, 1975, 125pp.

Appendix 2

NUTRIENT COMPOSITION OF VARIOUS MILK FEEDINGS

	Human Milk	Whole Cow's Milk	Skim Milk	Enfamil with Iron	Similac with Iron	SMA	Isomil
KILOCALORIES/OZ.	20	20	10	20	20	20	20
PROTEIN (g/l)	12	33	35	15	15	15	20
Whey:Casein Ratio	60:40	20:80	20:80	20:80	20:80	60:40	20:80
CARBOHYDRATE (g/l)	70	48	48	70	72	72	68
FAT (g/l)	38	37	2	37	36	36	36
Fatty Acids (g/l)							
Polyunsaturated	7.0	1.4	0.07	17.0	11.0	5.0	11.0
Saturated	17.0	23.5	1.2	11.0	18.0	15.0	18.0
Monounsaturated	19	11	0.5	7	5	14	5
Vitamin E:PUFA Ratio	0.4	0.7	-	0.5	1.0	1.3	1.0
Cholesterol (mg/100ml)	14.5	14.4	2.1	1.1	1.1	3.3	0
MINERALS (g/l)	2.1	7.2	7.9	3.6	3.7	2.5	3.8
Na (mEq/l)	7	25	26	11	12	7	13
Ca (mg/l)	340	1170	1100	500	580	312	700
P (mg/l)	150	920	900	400	430	500	500
Fe (mg/l)	0.5	0.5	0.5	12.0	12.0	12.0	12.0
Zn (mg/l)	1.6	3.9	4.1	4.2	5.0	3.7	5.0
Renal Solute Load*	77	226	240	105	108	90	126
VITAMINS (per liter)							
Vitamin A (IU)	2500	1423	2110**	1690	2500	2640	2500
Vitamin D (IU)	22	423**	400**	420	400	420	400
Vitamin C (mg)	52	15	10	55	55	58	55

*RSL= [PRO(g)x4] + [Na(mEq)] + [K(mEq)] + [Cl(mEq)]

**Fortified with vitamin A and/or vitamin D

SOURCES: Fomon, S.J., Infant Nutrition, 1974.

Nelson W., Textbook of Pediatrics, 1979.

USDA, Composition of Foods, Agricultural Handbook No 8-1, 1975.

Formula Company Manuals: Ross Labs, Wyeth Labs, and Mead Johnson Company.

FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
RECOMMENDED DAILY DIETARY ALLOWANCES,^a Revised 1980
Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.

	Fat-Soluble Vitamins					Water-Soluble Vitamins					Minerals									
	Age (years)	Weight (kg)	Height (cm)	Protein (g)	Vita- min A (μ g ae) ^a	Vita- min D (μ g) ^c	Vita- min E (mg α -TE) ^d	Vita- min C (mg)	Thia- min (mg)	Ribo- flavin (mg)	Niacin (mg NE) ^e	Vita- min B-6 (mg)	Fola- cir ^f (μ g)	Vitamin B-12 (μ g)	Cal- cium (mg)	Phos- phorus (mg)	Mag- nesium (mg)	Iron (mg)	Zinc (mg)	Iodine (μ g)
Infants	0.0-0.5	6	13	60	24	420	10	3	35	0.3	0.4	0.3	30	0.5 ^g	360	240	50	10	3	40
	0.5-1.0	9	20	71	28	400	10	4	35	0.5	0.6	0.6	45	1.5	540	360	70	15	5	50
Females	11-14	46	101	157	62	800	10	8	50	1.1	1.3	1.8	400	3.0	1200	1200	300	18	15	150
	15-18	55	120	163	64	800	10	8	60	1.1	1.3	2.0	400	3.0	1200	1200	300	18	15	150
	19-22	55	120	163	64	800	7.5	8	60	1.1	1.3	2.0	400	3.0	800	800	300	18	15	150
	23-50	55	120	163	64	800	5	8	60	1.0	1.2	2.0	400	3.0	800	800	300	18	15	150
	51+	55	120	163	64	800	5	8	60	1.0	1.2	2.0	400	3.0	800	800	300	10	15	150
Pregnant						+200	+5	+2	+20	+0.4	+0.3	+0.6	+400	+1.0	+400	+400	+150	h	+5	+25
Lactating						+400	+5	+3	+40	+0.5	+0.5	+0.5	+100	+1.0	+400	+400	+150	h	+10	+50

^a The allowances are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined. See text for detailed discussion of allowances and of nutrients not tabulated. See Table 1 (p. 20) for weights and heights by individual year of age. See Table 3 (p. 23) for suggested average energy intakes.

^b Retinol equivalents. 1 retinol equivalent = 1 μ g retinol or 6 μ g β carotene. See text for calculation of vitamin A activity of diets as retinol equivalents.

^c As cholecalciferol. 10 μ g cholecalciferol = 400 IU of vitamin D.

^d α -tocopherol equivalents. 1 mg d - α tocopherol = 1 α -TE. See text for variation in allowances and calculation of vitamin E activity of the diet as α -tocopherol equivalents.

^e 1 NE (niacin equivalent) is equal to 1 mg of niacin or 60 mg of dietary tryptophan.

^f The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay after

treatment with enzymes (conjugases) to make polyglutamyl forms of the vitamin available to the test organism.

^g The recommended dietary allowance for vitamin B-12 in infants is based on average concentration of the vitamin in human milk. The allowances after weaning are based on energy intake (as recommended by the American Academy of Pediatrics) and consideration of other factors, such as intestinal absorption; see text.

^h The increased requirement during pregnancy cannot be met by the iron content of habitual American diets nor by the existing iron stores of many women; therefore the use of 30-60 mg of supplemental iron is recommended. Iron needs during lactation are not substantially different from those of nonpregnant women, but continued supplementation of the mother for 2-3 months after parturition is advisable in order to replenish stores depleted by pregnancy.

Appendix 4

RECOMMENDATIONS FOR FLUORIDE SUPPLEMENTATION (mg/day)

AGE	0-2 yrs.	2-3 yrs.	3 and over
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WATER SUPPLY

Non-fluoridated	0.25	0.50	1.0
Fluoridated	0*	0	0

*Infants who receive breast milk or whole cow's milk from 0-1 yrs. need a 0.25 mg supplement or the following amounts of fluoridated water and/or concentrated formula reconstituted with fluoridated water: (See accompanying note)

<u>FLUORIDATED WATER</u>		<u>FORMULA</u> (concentrate & fluoridated water)	
AGE: 2mos -	6oz.	or	10oz.
4mos -	6oz.	or	10oz.
6mos -	6oz.	or	10oz.
9mos -	4oz.	or	6oz.

NOTE: This chart is based on the amount of fluoride an infant would consume in a typical diet, as delineated by Samuel Fomon in "What Are Infants in the United States Fed," Pediatrics, 1975. The water intake necessary at 2, 4, and 6 months (6oz.) is higher than the average amounts Fomon found infants consume at these ages, those amounts being 3, 3, and 4oz. respectively.

It is difficult to determine the precise amount of fluoride in an infant's diet due to the varying effects of processing and preparation on the fluoride content of food items. However, in general the fluoride content of the foods commonly fed to infants is so low that it does not affect the total fluoride intake one way or the other. An exception is strained or junior chicken which, because it contains bone meal which is high in fluoride, provides sufficient daily fluoride in one jar.

The intakes used as the basis for the chart are based on the assumption that an infant is drinking infant juice. If a mother uses reconstituted frozen juice or dilutes the juice given to the baby, the amount of water used should be taken into account.

Finally, the recommended water and/or formula intakes provide the minimum amount of fluoride infants should consume. Even if the infant receives the amount of water listed in the chart and also receives a 0.25 mg. supplement, it is unlikely that s/he will be receiving too much fluoride.

Appendix 5

RECOMMENDATIONS FOR VITAMIN/MINERAL SUPPLEMENTATION FOR INFANTS (0-12 Months)

Type of Feeding	Age	Vitamin/Mineral Needed	Daily Amount	Comments
BREAST MILK	0-12 mos.	Vitamin D	400 I.U.	
	0-12 mos.	Fluoride	0.25 mg	Not needed if infant consumes 6 oz. fluoridated water/day.
	0-6 mos. 6-12 mos.	Vitamin B12 Vitamin B12	0-5 mcg 1.5 mcg	If mother is a vegan.
	6-12 mos.	Iron	15 mg	Preferably obtained from food. May be started before 6 months.
IRON-FORTIFIED FORMULA	0-12 mos.	Fluoride	0.25 mg	If water is non-fluoridated.
NON IRON-FORTIFIED FORMULA	0-12 mos.	Fluoride	0.25 mg	If water is non-fluoridated.
	4-6 mos. 6-12 mos.	Iron Iron	10 mg 15 mg	Preferably obtained from food.
COW'S MILK OR EVAPORATED MILK	0-12 mos.	Vitamin C	35 mg	Preferably obtained from food after 6 mos.
	0-12 mos.	Fluoride	0.25 mg	Not needed if infant consumes 6 oz. fluoridated water/day.
	4-6 mos. 6-12 mos.	Iron Iron	10mg 15mg	Preferably obtained from food.

Appendix 5 (Cont.)

CATEGORIES OF PEDIATRIC VITAMINS - FOR INFANTS (0-12 Months)

	VITAMINS ADC*	MULTIVITAMINS
	Tri-Vi-Sol Drops (MJ) Vi-Daylin-ADC Drops (Ross) Vi-Penta Infant Drops (Roche)	Poly-Vi-Sol Drops (MJ) Vi-Daylin Drops (Ross) Vi-Daylin Liquid (Ross) Vi-Penta Multivitamin Drops (Roche)
IRON ADDED	Tri-Vi-Sol with Iron Drops (MJ) Vi-Daylin Plus Iron ADC Drops (Ross)	Poly-Vi-Sol Drops and Iron (MJ) Vi-Daylin Plus Iron Drops (Ross) Vi-Daylin Plus Iron Liquid (Ross)
FLUORIDE ADDED	0.25mg F Tri-Vi-Flor 0.25 mg Drops (MJ) Vi-Daylin/F ADC Drops (Ross)	Poly-Vi-Flor 0.25 mg Drops (MJ) Vi-Daylin/F Drops (Ross)
	0.50mg F** Tri-Vi-Flor Drops (MJ) Vi-Penta F Infant Drops (Roche)+	Poly-Vi-Flor Drops (MJ) Vi-Penta F Multivitamins Drops (Roche)
IRON & FLUORIDE ADDED	0.25mg F Tri-Vi-Flor 0.25 mg with Iron Drops (MJ) Vi-Daylin/F ADC and Iron Drops (Ross)	Vi-Daylin/F Plus Iron Drops (Ross)
	0.50mg F**	Poly-Vi-Flor with Iron Drops (MJ)

* Contains vitamins A, D, and C

** Not recommended for children less than 2 years old

+ Also contains vitamin E

- All the above infant vitamin/mineral preparations are in the form of drops.

- Abbreviations for company names used: MJ Mead-Johnson & Company
Roche Roche Laboratories
Ross Ross Laboratories

Appendix 6

PREPARATION AND SANITATION

I. Breast Milk

A. Sterilizing equipment

1. Wash hands thoroughly in hot, soapy water.
2. Boil the collection jar, storage container, lid, etc. in water for five minutes.
3. If using a breast pump, remove all plastic and rubber parts and then boil the pump for five minutes.
4. Do not touch the inside of any equipment once it has been sterilized.

B. Expression

1. Wash hands thoroughly in hot, soapy water.
2. Hand express or pump milk directly into sterilized collection jar. Pour expressed milk into sterilized storage container; cover tightly. If milk is to be frozen, leave 1/2 inch space at the top of container.

C. Storage

1. Chill milk immediately in refrigerator. Milk can be kept 24 hours in refrigerator.
2. If milk will not be used within 24 hours, place in freezer.
 - If milk is to be added to a bottle already in freezer, chill milk first.
 - Milk can be stored in freezer compartment for 2 weeks; in deep freeze unit for 2 months.
3. Defrosting frozen milk:
 - Remove container from freezer, hold under warm tap water or place in pan of water. Heat to body temperature.
 - Use immediately after thawed and warmed.
 - Dispose of any defrosted milk which is not used.

Appendix 6 (Con't)

II. Infant Formula

A. Preparation

1. Wash hands before beginning preparation.
2. Equipment
 - a. Wash bottles, nipples, collars, can opener, measuring cup and all other equipment in hot soapy water. Rinse in hot water. *
 - b. Wash the top of the can of formula before opening.
3. Water

Water needed for preparation of powdered or concentrated formula should be boiled for five minutes, until the infant is two months old. After two months, it is generally not necessary to boil the water.*

B. Storage

1. Prepared formula should be used immediately or stored in the refrigerator until needed.
2. Prepared formula or opened formula cans, should be covered and stored in the refrigerator no longer than 24 hours.
3. Any formula left in the bottle after feeding should be discarded.

*Sterilization of equipment and of water after the infant is 2 months old, is necessary only if the water supply is contaminated or if sanitation in the household is inadequate.

If sterilization is deemed necessary, equipment and water should be boiled for five minutes.

III. Homemade Baby foods

A. Preparation

1. Wash hands in hot, soapy water.
2. Wash cooking equipment, containers, grinder, blender, utensils, and preparation surfaces thoroughly with hot, soapy water. Rinse well with hot water.
3. Vegetables and fruits: Wash fruits and vegetables carefully. Remove blemished spots. Remove skin, pits and seeds (this can be done after cooking). Steam or boil in a small amount of water to preserve nutrients. Cook until they can be mashed with a fork or food grinder; do not over cook.

Appendix 6 (con't)

4. Meats: Trim fat, gristle and bone. Bake, broil or boil in small amount of water with no seasoning or added fat. Place in clean blender or food grinder.






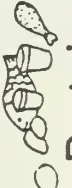
B. Serving

1. If more than one serving has been prepared, place the food in a separate dish for feeding. (The infant's saliva may cause the food to spoil more rapidly if fed from the original container.)
2. Serve immediately and discard any food which is not eaten.

C. Storage (in refrigerator or freezer)

1. If food is prepared ahead of time or in large quantities, place in clean glass or plastic container and cover immediately after cooking. Chill immediately.
2. In refrigerator: Store no more than 48 hours.
3. In the freezer: Store no more than 1 month. To prepare single servings for freezing, freeze in clean cube ice trays or muffin liners and cover with freezer paper or aluminum foil. Once frozen, remove and store in plastic bags or glass jars.
4. To defrost:
 - Thaw food in refrigerator and use within 48 hours, or
 - Place frozen food in heat-proof glass dish, cover, and warm in oven or in pan of water on stove.
 - Discard any thawed, heated food which is not eaten.

INFANT FEEDING GUIDE

Foods	Months	0-4 MONTHS	4-6 MONTHS	6-8 MONTHS	8-10 MONTHS	10-12 MONTHS
 Breastmilk or Iron-Fortified Formula	5-10 feedings 16-32 ounces	4-7 feedings 24-40 ounces	3-4 feedings 24-32 ounces	3-4 feedings 16-32 ounces Whole milk can be introduced now.	3-4 feedings 16-24 ounces Whole milk can be introduced now.	3-4 feedings 16-24 ounces Whole milk can be introduced now.
 Cereals & Bread	NONE	•Boxed rice, oatmeal or barley (spoonfed) Mix 2-3 teaspoons with formula, water or breastmilk	•All varieties of boxed infant cereal except Cera-meal or cereal with fruit or honey (Twice a day)	•Infant cereals Cream of Wheat or other plain hot cereals •Toast, bagel or crackers	•Infant or cooked cereals •Unsweetened cereals •Bread •Rice •Noodles & Spaghetti	
 Fruit Juices	NONE	•Infant juice •Adult apple juice, Vitamin-C fortified (Avoid orange & tomato juice now) (2-4 oz. a day)	•Infant juice •Adult apple juice, Vitamin-C fortified Try juice from a cup (4 ounces)	•All 100% juices Orange and tomato juice can be introduced now.	•All 100% juices Orange and tomato juice can be introduced now.	•All 100% juices Orange and tomato juice can be introduced now.
 Vegetables	NONE	NONE	•Strained or mashed vegetables - dark yellow or orange (avoid corn) - dark green (1/2-1 jar or 1/4-1/2 cup a day)	•Cooked, mashed family vegetables •Junior vegetables	•Cooked vegetable pieces •Some raw vegetables -carrots -tomatoes -cucumbers	•Cooked vegetable pieces •Some raw vegetables -carrots -tomatoes -cucumbers
 Fruits	NONE	NONE	•Fresh or cooked fruits - mashed bananas - applesauce •Strained fruits (1 jar or 1/2 cup per day)	•Peeled, soft fruit wedges - bananas, peaches, pears, oranges, apples	•All fresh fruits peeled and seeded •Canned, packed in water	•All fresh fruits peeled and seeded •Canned, packed in water
 Protein Foods	NONE	NONE	Try plain yogurt	•Lean meat, chicken and fish (strained, chopped or small tender pieces) •Egg yolk, yogurt, mild cheese, peanut butter, cooked dried beans	•Small tender pieces of meat, fish or chicken •Whole egg •Cheese •Yogurt •Cooked dried beans •Peanut butter	•Small tender pieces of meat, fish or chicken •Whole egg •Cheese •Yogurt •Cooked dried beans •Peanut butter

NAME	MANUFACTURER	COMPOSITION				INDICATIONS & COMMENTS
		Protein	Carbohydrate	Fat	Kcal/oz.	
REGULAR MILK-BASED						
Enfamil with Iron	Mead Johnson	Nonfat milk	Lactose	Soy & Coco. oil	20	<ol style="list-style-type: none"> 1. Normal infant feedings 2. Sick infants without nutritional problems 3. Supplement to breastfeeding 4. Products which read "with iron" contain 12 mg. iron/liter 5. Products with demineralized whey have a whey:casein ratio of 60:40, ie, similar to breastmilk 6. SMA and PM 60/40 have reduced levels of sodium and potassium -useful for infants with reduced cardiovascular function 7. Ca:P ratio of PM 60/40 makes it preferred formula for infants with impaired renal function
Enfamil	Mead Johnson	Nonfat milk	Lactose	Soy & Coco. oil	20	
SMA (with Iron)	Wyeth	Nonfat milk Demin. whey	Lactose	Soy, Coco. & Saff. oil, Oleo	20	
SMA Lo Iron	Wyeth	Nonfat milk Demin. whey	Lactose	Soy, Coco. & Saff. oil, Oleo	20	
Similac Whey (with Iron)	Ross	Nonfat milk Demin. whey	Lactose	Soy & Coco. oil	20	
Similac with Iron	Ross	Nonfat milk	Lactose	Soy & Coco. oil	20	
Similac	Ross	Nonfat milk	Lactose	Soy & Coco. oil	20	
PM 60/40	Ross	Demin. whey Ca & Na caseinate	Lactose	Coco. & Corn oil	20	
SOY-BASED						
Isomil	Ross	Soy pro. isolate	Corn syrup Sucrose	Coco. & Soy oil	20	<ol style="list-style-type: none"> 1. Milk intolerance 2. Lactose deficiency 3. Galactosemia 4. Sucrose-free products useful for infants with sucrose intolerance 5. Corn-free products useful for infants with corn intolerance 6. All soy-based formulas contain 12 mg. iron/liter
Isomil SF	Ross	Soy pro. isolate	Corn syrup	Coco. & Soy oil	20	
Nursoy	Wyeth	Soy pro. isolate	Sucrose	Oleo, Coco., Saff. & Soy oil	20	
Prosobee	Mead Johnson	Soy pro. isolate	Corn syrup	Coco. & Soy oil	20	
Soyalac	Loma Linda	Soybean solids	Corn syrup Sucrose	Soy oil	20	
I-Soyalac	Loma Linda	Soy pro. isolate	Sucrose Tap. dextrins	Soy oil	20	
MEAT-BASED						
Meat-Base Formula	Gerber	Beef hearts	Sucrose Mod. tap. starch	Sesame oil	20	<ol style="list-style-type: none"> 1. Milk allergy 2. Soy allergy 3. Galactosemia 4. Lactase deficiency 5. Glycogen storage disease

NAME	MANUFACTURER	COMPOSITION				INDICATIONS AND COMMENTS
		Protein	Carbo- hydrate	Fat	Kcal/oz.	
<div>SPECIAL</div> <div>PRO/CHO/FAT</div> <div>INTOLERANCE</div>						
Nutramigen	Mead Johnson	Hydrol. casein	Sucrose Mod. tap. starch	Corn oil	20	<ol style="list-style-type: none"> 1. Intact protein intolerance 2. Lactase deficiency 3. Galactosemia 4. Recovery stage after mild/moderate diarrhea
Pregestimil	Mead Johnson	Hydrol. casein L-cystine L-tyro. L-tryp.	Corn syrup Mod. tap. starch	Corn oil -60% MCT-40%	20	<ol style="list-style-type: none"> 1. Intact protein intolerance with sensitivity to hyperosmolar solutions. Less palatable than Nutramigen. 2. Disaccharidase deficiency 3. Malabsorption: short gut syndrome; cystic fibrosis; celiac disease 4. Interim formula during transition from hyperalimentation to normal oral intake 5. Recovery stage after prolonged diarrhea
Portagen	Mead Johnson	Na caseinate	Corn syrup Sucrose	MCT-86% Corn oil -11% Soy lecithin 3%	20	Fat malabsorption: pancreatic insufficiency; bile acid deficiency; intestinal resection; lymphatic anomalies
Product 3232A	Mead Johnson	Hydrol. casein	Mod. tap. starch	MCT Corn oil	20 if 59 gm. CHO is added/qt.	<ol style="list-style-type: none"> 1. Carbohydrate intolerance: congenital glucose-galactose malabsorption 2. Recovery stage after severe gastroenteritis or intractable, chronic diarrhea 3. Carbohydrate must be added
RCF	Ross	Soy pro. isolate	—	Coco. & Soy oil	20 if 52 gm. CHO is added/qt.	

NAME	MANUFACTURER	COMPOSITION			Kcal/oz.	INDICATIONS AND COMMENTS
		Protein	Carbohydrate	Fat		
SPECIAL INBORN ERRORS OF METABOLISM						
Lofenalac	Mead Johnson	Hydrol. casein - most phenyl. removed L-tyro. L-tryp. L-hist. L-meth.	Corn syrup Mod. tap. starch	Corn oil	20	1. Phenylketonuria, during infancy 2. Average intake: 4 mos.-3 cans/month 12 mos.-5 cans/month 24 mos.-6 cans/month
Phenyl- Free	Mead Johnson	Amino acids No phenyl.	Sucrose Corn syrup solids Mod. tap. starch	Corn oil	25	1. Phenylketonuria, after infancy 2. Phenylalanine must be added from other sources 3. Average intake: Children- same as Lofenalac Pregnant women- 9-10 cans/ month
PKU-1	Milupa	L-amino acids No phenyl.	Sucrose (Min. amt. used in processing)	—	20 when mixed with recom. amts. of CHO & FAT	1. Phenylketonuria, during infancy 2. Not a complete food; fat and carbohydrate must be added, per instructions in company handbook 3. Average intake: 3 cans/month
PKU-2	Milupa	L-amino acids No phenyl.	Sucrose (Min. amt. used in processing)	—	2.95/gm.	1. Phenylketonuria, after infancy 2. Not a complete food; fat and carbohydrate must be added. Powder is added to various beverages, per instructions in company handbook 3. Average intake: 3 cans/month
MSUD Diet Powder	Mead Johnson	Amino acids No br.-chain a.a. (leu., isoleu., val.)	Corn syrup solids Mod. tap. starch	Corn oil	20	1. Maple syrup urine disease, during infancy and childhood 2. Diet must be supplemented with milk and other foods once plasma levels of amino acids reach normal levels 3. Average intake: Double that of Lofenalac
Product 3200AB	Mead Johnson	Hydrol. casein Very low levels of tyro. & phenyl.	Corn syrup solids Mod. tap. starch	Corn oil	20	1. Tyrosinemia 2. Tyrosine and phenylalanine must be added from other sources 3. Average intake: Same as Lofenalac
Product 3200K	Mead Johnson	Soy pro. isolate Moderate amt. meth.	Corn syrup solids	Coco. & Corn oil	20	1. Homocystinuria 2. Amount of methionine in formula is usually adequate for growth 3. Average intake: Same as Lofenalac
Product 80056	Mead Johnson	—	Corn syrup solids Mod. tap. starch	Corn oil	Depends on amount of PRO added	1. Infants requiring specific mixtures of amino acids 2. Not a complete food; protein must be added

Appendix 9

GUIDELINES REGARDING INFANT FEEDING

Massachusetts WIC Program
Federal Regulations (7 CFR 246.8)

Breastfeeding

- Breastfeeding women are eligible to receive a WIC food package until their infant is one year old; non-breastfeeding women may be eligible until their infant is 6 months old.
- If either one of the breastfeeding dyad (woman and infant) is WIC-eligible, then the other one may also be enrolled on WIC.
- Infants who are breastfed may also receive some formula.
- Breastfeeding should be encouraged and supported for all women who wish to nurse their infants.

Formula

- The standard formula available to an infant who is not breastfed is iron-fortified formula, milk or soy-based. The formula must contain 20 kcal/oz at standard dilution and at least 10 mg iron/liter. It must be a complete formula, not requiring the addition of any ingredient but water.
- Infants receive formula until they are 12 months old. (However, a physician may order whole cow's milk for an infant 6-12 months of age, on a case by case basis.) Routinely, infants will be switched from formula to whole cow's milk at one year of age.
- A physician may request
 - non-iron fortified formula
 - prescription formulafor an infant 0-12 months on a case by case basis.
- Formula is available in 13 oz. concentrate or 1 lb. powder sizes. Under special circumstances, a nutritionist may choose to provide ready-to-feed formula.

Cow's Milk

- Whole cow's milk and evaporated milk are available only after an infant turns one year old. (With a physician's order, milk may be supplied between 6-12 months of age.)
- Low-fat milk is also unavailable for an infant; low-fat milk is not recommended until a child is 18-24 months of age.

Appendix 9 (Con't)

Beikost

- Dry, iron-fortified infant cereal is available to an infant who is 4-12 months of age. The cereal must contain at least 45 mg. iron/100 g. cereal. No cereals with added fruits are allowed.
- 100% fruit juice (including infant juice) is available to an infant who is 4-12 months of age. The juice must contain at least 30 mg. vitamin C/100 ml. juice.

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